

GEANT Description of the Material in the Inner Tracker: an update on the speed issue

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Recent changes

- Description of passive material in the tracker
 - no change w.r.t. last simulation meeting
 - new pieces described last week are in CVS
 - will appear in 4.6.0int3
- Central beam-pipe
 - what has changed
- Performance issue: improving the speed
 - description and GEANT tracking
 - the new solution (in 4.6.0int3)
 - timing comparison
 - further improvement foreseeable

NB: recent change in the beam-pipe

- Overlap found in simulation: beampipe/L00 support structure
 - 300 micron overlap for the low-radius ladders
 - beampipe description turned out to be wrong
 - fixed by Elena on Tuesday, should be OK in 4.6.1
- Features: old vs. new:
 - thickness: $583.8 \mu\text{m} \rightarrow 508 \mu\text{m}$
 - outer radius: $1.31318 \text{ cm} \rightarrow 1.26238 \text{ cm}$
 - \rightarrow radiation length change: $\sim 0.16\% X_0 \rightarrow \sim 0.14\% X_0$
- Impact on physics
 - almost none
 - e.g.: $\sim 1\%$ change in total X_0 seen by a track ($? < 0.5$)

Passive Material & GEANT Tracking

- Our most complex “detector” !
 - ~7600 physical volumes in the latest version
 - ~20 new material/compounds definitions
 - 72 kg of material
 - mostly in the tracking acceptance
 - actual weight: 120 kg (including outside tracker acceptance)
 - documented in note 5825
- Tough task for GEANT
 - large number of volumes
 - flat structure, all volumes inside SVXC
 - ➔ large slow-down of the simulation
 - (affects also other customers, like G3Extrapolator)

New volume hierarchy

- Requirements

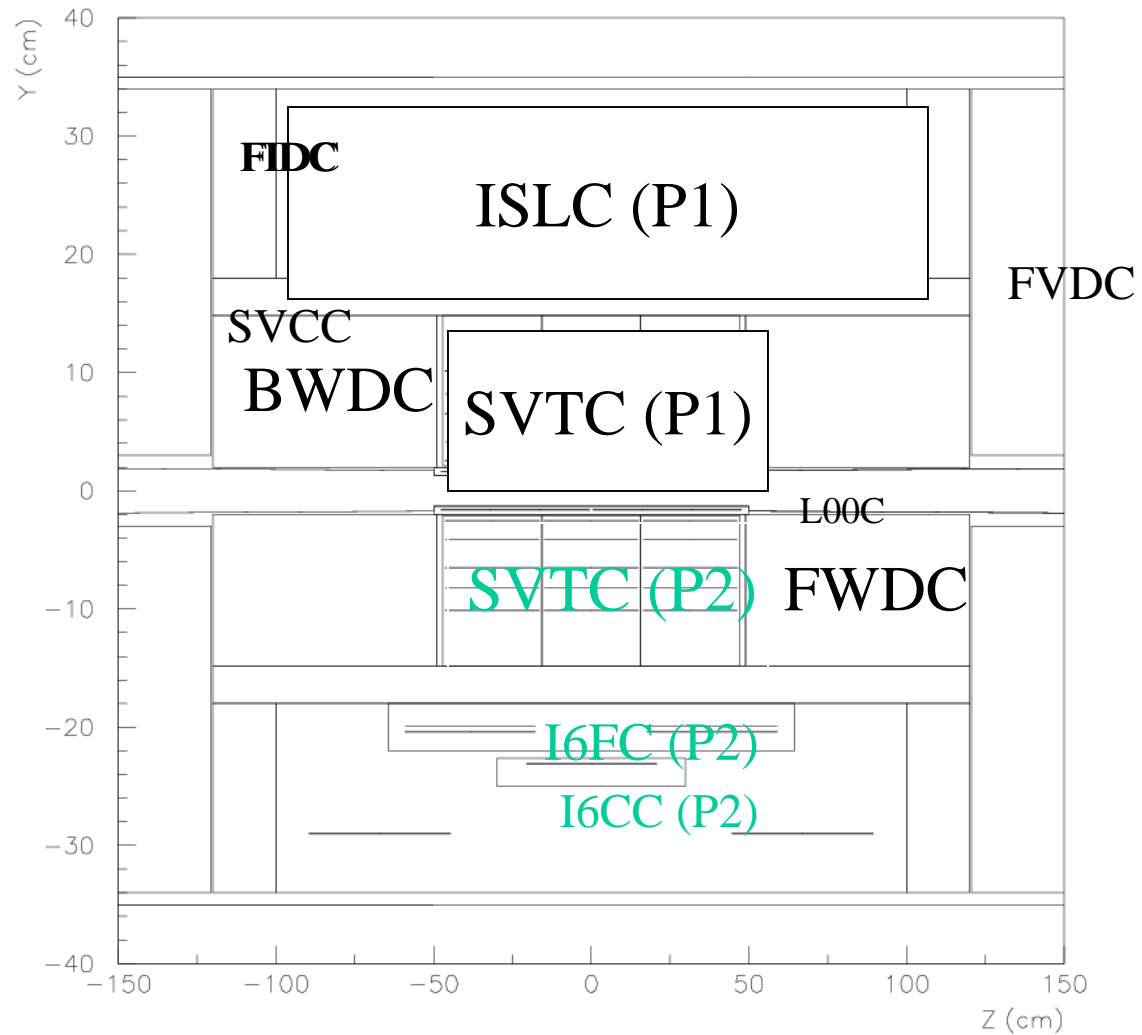
- small development time (≤ 1 week)
- limit the impact on other pieces of code
 - silicon sensors have to belong to containment volumes centered in (0,0,0)

- Status

- 10 container volumes introduced (cf. next slide)
- code in CVS, will be in 4.6.0int3
- speed improvement noticeable

New volume hierarchy

SVXC



Timing comparison

- Quick study with 100 tt events on a Linux box
- AC++ timer, time spent in SimulationCtrl
- **material**: 4500 volumes, **w/ new material**: 7600 volumes

	4.5.0 (old struct.)	Pass 1	Pass 1 w/ new material	Pass 2 w/ new material
Passive OFF	11 s / evt	9 s / evt	n/a	n/a
Passive ON	50 s / evt	15 s / evt	33 s / evt	20 s / evt

Conclusion

- New volume hierarchy
 - pass 1 ready and in CVS
 - gain in speed
 - factor of 4 with 4.5.0 geometry
 - reduced to a factor of 1.5 with latest passive material
- Further improvement foreseen (pass 2+)
 - the code for a gain of 2.5 already exists
 - further subdivision possible
 - all that has to be discussed with the silicon geometry experts, because the sensors have to be moved !!